KENTUCKY

AGRICULTURAL EXPERIMENT STATION

OF THE

STATE COLLEGE OF KENTUCKY.

BULLETIN NO. 77.

WHEAT.

1. Test of Varieties.
2. Test of Fertilizers.
3. Notes and Descriptions.
4. Red Rust of Wheat.

H. GARMAN

LEXINGTON, KENTUCKY.

September, 1898.

KENTUCKY

Agricultural Experiment Station.

NOTICE.

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KENTUCKY AGRICULTURAL EXPERIMENT STATION,

LEXINGTON, KY.

BULLETIN No. 77.

WHEAT.

The Soil.—The experiments were conducted on the Experiment Station grounds, the character of the soil of which has been described in previous bulletins.

The Season.—The following table shows the rainfall per month, highest, lowest and average temperature, and the amount of sunshine during the wheat season:

Months, 1897–1898.	Per Cent. Sunshine	Clouds.	Amount of Rainfall in inches.	Temperature, Degrees.		
				Mean.	Highest.	Lowest.
September	82.0	18.0	.80	72.4	96	40
October	76.0	24.0	.38	63.9	88	36
November	39.0	61.0	4.83	46.4	71	17
December	20.0	80.0	5.11	36.8	67	8
January	24.0	76.0	9.56	38.0	68	11
February	28.0	72.0	2.20	36.1	66	-1
March	19.0	81.0	8.18	49.0	72	26
April	31.0	69.0	3.29	50.7	77	22
May	45.0	55.0	6.13	65.4	85	33
June	47.0	53.0	7.94	74.4	93	57

1. TEST OF VARIETIES.

Twenty varieties were under test. Each variety was planted on a one-twentieth-acre plot, in drills seven inches apart. The amount of seed sown was at the rate of one and

one-half bushels per acre. All plots were planted October 25 1897, and harvested June 27, 1898.

Notes on Varieties.

Plot Number.	Name of Variety.	Head S—Smooth B—Bearded	Average Height—Inches.	Length of Head—Inches.	Average Stalks to Stool.
1	Jones' Winter Fife	S.	46	4.5	14
2	American Bronze	S.	48	4.5	12
3	Early White Leader	S.	44	4.	11
4	Pride of Genesee	B.	46	4.75	13
5	Oatka Chief	B.	42	3.75	10
6	Long Amber	S.	48	4.75	14
7	Jones' Bearded	B.	40	3.5	9
8	Pride	B.	43	4.5	9
9	Bearded Winter Fife	B.	42	4.25	10
10	Early Arcadian	S.	39	3.25	10
11	Pedigreed Early Genesee Giant	B.	38	2.75	11
12	Diamond Grit	B.	39	3.5	12
13	White Golden Cross	B.	34	2.75	8
14	Lancaster Red	B.	43	4.	15
15	Democrat	B.	36	3.75	16
16	Gold Coin	S.	37	3.5	11
17	Dawson's Golden Chaff	S.	38	4.25	13
18	Jersey Fultz	S.	43	3.75	17
19	Extra Early Oakley	S.	40	2.75	14
20	(Gold Coin?)	S.	35	3.	7

The following table gives the yield of each variety and the weight of wheat per measured bushel:

Plot Number.	Name of Variety.	Head B—Bearded S—Smooth head.	Yield per Acre. Grain, Bushels.	Yield per Acre. Straw, Pounds.	Weight per bushel, lbs.
1	Jones' Winter Fife	S.	22.3	2160	63.7
2	American Bronze	S.	18.5	1790	62.8
3	Early White Leader	S.	19.0	2160	60.2
4	Pride of Genesee	B.	16.5	1710	64.4
5	Oatka Chief	B.	13.3	1400	60.8
6	Long Amber	S.	10.8	1050	60.8
7	Jones' Bearded	B.	13.2	1510	60.4
8	Pride	B.	14.8	1510	64.0
9	Bearded Winter Fife	B.	18.2	610	64.0
10	Early Arcadian	S.	12.8	2230	59.0
11	Pedigreed Early Genesee Giant	B.	16.5	1310	61.6
12	Diamond Grit	B.	16.5	1610	64.0
13	White Golden Cross	B.	11.5	1210	59.0
14	Lancaster Red	B.	17.7	1640	63.8
15	Democrat	B.	12.2	1370	64.3
16	Gold Coin	S.	12.3	1060	61.8
17	Dawson's Golden Chaff	S.	11.3	1120	62.6
18	Jersey Fultz	S.	17.8	1330	64.7
19	Extra Early Oakley	S.	15.2	1690	64.2
20	(Gold Coin?)	S.	13.6	780	63.0

Some of these varieties have been grown by us for several years. The following table gives the yield of such varieties for the different years, and the average yield for the whole period :

Comparative Yield in Different Years.

Name of Variety.	Yield in Bushels per Acre.					
	1891	1892	1895	1897	1898	Av'ge.
Jones' Winter Fife	30.7	22.8	14.6	23.0	22.3	22.7
American Bronze				16.0	18.5	17.3
Eraly White Leader				7.3	19.0	13.2
Pride of Genesee				21.8	16.5	19.2
Oatka Chief				25.3	13.3	19.3
Long Amber				20.0	10.8	15.4
Jones' Bearded				15.0	13.2	14.1
Pride				19.5	14.8	17.2
Bearded Winter Fife				30.5	18.2	24.4
Early Arcadian				27.4	12.8	20.1
Pedigreed Early Genesee Giant				26.8	16.5	21.7
Diamond Grit				21.0	16.5	18.8
White Golden Cross				27.9	11.5	19.7
Lancaster Red			15.0	16.9	17.7	16.5
Democrat			16.8	21.3	12.2	16.8
Gold Coin			13.1	21.	12.3	15.5
Dawson's Golden Chaff				17.	11.3	14.2
Jersey Fultz					17.8	17.8
Extra Early Oakley	21.8	20.0			15.2	19.0
Plot 20 (Gold Coin?)					13.6	13.6

Milling Qualities.

In order to test the different varieties of wheat as to their milling qualities the several samples were submitted, with their names, to Mr. C. S. Brent, and also, by their numbers, without disclosing their names, to Messrs. D. C. Frost, W. B. Talbert and R. S. Webb, who rated them independently, as follows:

By C. S. Brent. First rank as milling wheat, sample No. 18; second, No. 19; third, No. 12; fourth, No. 8; fifth, No. 4; sixth, No. 14; good, Nos. 9 and 15; fair, No. 2; bad, Nos. 1, 3, 5, 6, 7, 10, 11, 13, 16, 17 and 20.

By D. C. Frost. First, samples No. 18 and 19; second, Nos. 12 and 14; third, Nos. 2 and 15; fourth, Nos. 4 and 8; fifth, Nos. 5, 10, 11 and 13; sixth, Nos. 1 and 9; seventh, Nos. 6, 7 and 17; eighth, No. 3; ninth, Nos. 16 and 20.

By W. B. Talbert. First, Nos. 12, 14, 18 and 19; second Nos. 1, 2 and 15; third, Nos. 3, 9 and 20; fourth, Nos. 5, 10 and 13; fifth, Nos. 4, 6, 7, 8, 11, 16 and 17.

By R. S. Webb. First, Nos. 2, 12, 14, 18 and 19; second, Nos. 4 and 8; third, Nos. 11 and 15; fourth, Nos. 1, 6, 13 and 17; fifth, Nos. 5, 7, 9 and 10; sixth, not worth planting, Nos. 3, 16 and 20.

2. TEST OF FERTILIZERS.

This year, as heretofore, fertilizers had no appreciable effect on the yield of grain or straw. The kind of fertilizers used and the manner of applying them were the same as in years previous, for which see Bulletin 57. The results of the year are of so little value when taken alone that it is thought best not to publish them herein.

Co-operative Fertilizer Tests.

A few co-operative tests with fertilizers were undertaken last year by farmers. The following results were obtained by Mr. E. G. Austin, of Prentis, Ohio County, Ky. Ohio

County is in the western coal measures of Kentucky. The results obtained by Mr. Austin will undoubtedly be of benefit to all farmers situated on this geological formation. The following is Mr. Austin's report:

Results Obtained With Fertilizers by Mr. Austin.

No. of Plot.	Fertilizers Applied.	Amount in pounds used per acre.	Yield of Wheat, bushels.	Weight per bu.
1.	No Fertilizer	.....	3.9	55
2.	Nitrate of soda	160 lbs.	9.4	58
3.	Acid phosphate	320 "	15.3	58
4.	Muriate of potash	160 "	6.4	57
5.	No Fertilizer	.....	7.6	57
6.	Nitrate of soda Acid phosphate	160 lbs. 320 "	19.6	59
7.	Nitrate of soda Muriate of potash	160 " 160 "	8.3	58
8.	Acid phosphate Muriate of potash	320 " 160 "	16.2	59
9.	Nitrate of soda Acid Phosphate Muriate of potash	160 " 320 " 160 "	20.7	60
10.	.....	.....	8.1	58

Mr. Austin says: "Find enclosed report of test with fertilizers furnished me last fall. The land upon which these tests were made has been in cultivation nearly fifty years—a

thin clay, upland soil, cultivated in corn in 1896, followed by rye, then cow peas, followed by wheat. The yield of corn was somewhere from fifteen to twenty bushels of inferior corn. The rye, a very scattering and inferior crop, was turned under in May and sowed to peas, which made a fair crop. That was removed for seed, the stubble harrowed twice with disc harrow, dragged once, and wheat drilled in with 250 pounds acid phosphate and fifty pounds muriate of potash with one bushel of wheat to the acre. The field, containing eleven and a half acres, yielded 192 bushels—the experimental acre eleven and a half bushels, and the balance of the field, ten and a half acres, 180½ bushels. One bushel of wheat drilled in our plots October 16th, 1897. Wheat all up and fertilizers sowed on top October 25th, 1897. Wheat weighed and tested by Beaver Dam Milling Co."

"The poor yield on Plot No. 1, I think, was due to bad drainage, as this plot lies very level, although high. The wheat on balance of field adjoining No. 1 was good. The field greened up and showed the effect of the fertilizers much earlier in the season than the plots did, due, I suppose, to the fertilizers on field having been put in with the wheat at the time of drilling. Plots Nos. 3, 6, 8 and 9 showed a rank growth early in the spring, and a very perceptible difference in their favor over plots 1, 2, 3, 4, 5, 7 and 10. Very little, in fact, no perceptible difference in the latter all through the season. Neither was there any perceptible difference in the former until near harvest time, when No. 9 began to show the best. The whole stood the winter well."

The above results of Mr. Austin strongly indicate the need of phosphoric acid on Mr. Austin's land. It may be possible that this is true also of nearly all the coal measures of Western Kentucky. These results show that Mr. Austin should use a fertilizer rich in phosphoric acid and containing a small amount of nitrogen. It seems that potash has little, if any, effect on wheat. It would be interesting to note whether this is true also of corn and potatoes.

3. NOTES ON THE VARIETIES.

BY H. GARMAN, ENTOMOLOGIST AND BOTANIST.

With the exception of Nos. 18, 19 and 20, the wheats grown this season are of the same varieties as those grown in 1897, and it will not, therefore, be necessary to describe all of them fully, since most of them are described and figured in Bulletin 79, published in September, 1897. The seasons of 1897 and 1898 were so different in the matter of rainfall that we should expect to find a corresponding seasonal difference in the wheats. It was anticipated that the frequent rains of 1898 would improve both the yield and the quality, but the following table shows that the reverse is true—that the heads of wheat produced in 1898 bore fewer seeds of less weight than those produced in 1897. The exceptions are No. 10, Early Arcadian, and No. 17, Dawson's Golden Chaff, both of which produced more seeds and of greater weight than in 1897. One point is to be kept in mind in using such figures as are given below, namely, that a variety may produce a large spike and but few of them to a stool, and that, consequently, another variety producing a much smaller head but more of them, may yield more to the acre. Again, the head may be large and the seed light, off color, or of poor milling qualities; hence, it is only by consideration of data obtained both in the field and in the laboratory that a safe conclusion with regard to a variety can be reached. The desideratum seems to be a wheat that will produce a large number of large heads with a plump seed of good weight. These qualities ought to mean a large yield per acre.

The effect of the wet season of 1898 seems to have been to increase the rust on many of the varieties. On several it is about the same as last year, while on only one—No. 6—was there less rust in 1898 than in 1897. An interesting fact appears in this relation. Nos. 18, 19 and 20, which were grown from seeds obtained from a local dealer, were free from rust, while all the other numbers, grown from seed raised on the Experiment Farm, were more or less rusted. Now, the

same varieties were, in many cases, affected with rust in 1897, and it may be supposed that the rust in 1898 was transmitted largely from the rusted wheat of the preceding year. The fact confirms the view often expressed that red rust is hereditary, and illustrates the importance of getting untainted seed for planting.

The Rating of Wheat in Bluegrass Kentucky.

The farmer of this region wants a good yielder in weight per acre. The color of the wheat is of little importance to him, except as it affects its sale. The general impression is, however, that white wheats do not do well here, and the result is that many farmers prefer a red wheat. The miller wants a good milling wheat, by which I understand that he desires wheat that is well ripened, plump, heavy and hard. The white wheats grown on the Experiment farm are not as hard as the red varieties and generally not as heavy. In rating them the miller and seedsman discriminate against them, however, with little regard to weight and hardness, and most of those who examined our wheats this year considered Nos. 16 and 20 (both white) as of poor quality, though their weight is exactly that of the red wheat No. 12, which was always rated as one of the best. That the white varieties are not from their nature inferior to the red in weight and hardness is shown by the fact that two white wheats before me, grown in New York, one bearded, the other smooth, weigh 7.5 grams per ten cubic centimeters, being thus heavier than the heaviest red wheat grown by us on the Experiment Farm. The size of the seed is of but little consequence to the millers, and Nos. 12, 18 and 19, which have the smallest seeds of those grown on the Experiment farm, are generally rated highest by them.

No. 18. Jersey Fultz.

Beardless. Seeds red. Spike small, tapering, the two diameters equal, about 0.375 inch. Length of spike, 3.6875 inches. Glumes not pubescent. Empty outer glumes terminating in a short blunt claw. Flowering glumes with a slightly longer claw-like tip, a few at the upper extremity

sometimes three-fourths inch long. Color of spike and stem, yellow. Average number of seeds from a spike, 33.75. Average weight of seeds from a spike, 1.175 grams.

This wheat seems to me to be identical with No. 19. The size and character of the head is the same, but the seed of this is a little heavier. It was rated first, or among the first, by every practical man who saw it. It is the heaviest wheat grown on the farm. Rust rare.

No. 19. Extra Early Oakley.

Beardless. Seeds red. Spike small, tapering, the two diameters equal, about 0.375 inch. Length of spike, 3.781 inches. Glumes not pubescent. Empty outer glumes terminating in short claws. Inner glumes with acute tips which in some cases reach a length of three-fourths inch at the extremities of spikes. Color of spike and stem, yellow. Average number of seeds from a spike, 43. Average weight of seeds from a spike, 1.55 gram.

This variety is in high favor in this section, and is always rated well by millers. It seems to me to be the same as No. 18, although its seeds do not weigh quite as much, bulk for bulk, and average a trifle larger. Rust rare.

No. 20. Gold Coin (?).

Beardless. Seeds white. Spike rather small, enlarging slightly at tip; greater diameter, 0.50 inch; lesser diameter, 0.375 inch. Length, 3.935 inches. Not pubescent. A few bristles on inner glumes at tip of spike one-fourth inch long, the rest with short and mostly blunt tips. Color of spike, bronzy; of stem, purplish. Average number of seeds from a spike, 42.75. Average weight of seeds from a spike, 1.525 gram.

This variety was obtained from a local dealer in seeds, and was marked No. 6, but appears to be the same as No. 16, which has been grown at the Station for some time. It is not liked by the millers. Rust rare.

No.	Name	Year.	Average length of spike in inches.	Average weight of seeds from one spike in grams	Weight of 10 cubic centimeters of seed in grams.	Average number of seeds from spike.	Rust.
1	Jones' Winter Fife.	1897	5.125	3.2875		86.75	Frequent.
		1898	5.125	2.25	7.	54.25	Frequent.
2	American Bronze.	1897	5.3125	2.4		56.5	Frequent.
		1898	4.375	2.175	7.2	52.	Frequent.
3	Early White Leader.	1897	5.34	2.85		74.25	Very abundant.
		1898	4.871	2.325	6.8	60.	Frequent.
4	Pride of Genesee.	1897	5.81	2.95		79.5	Frequent.
		1898	5.1875	2.925	7.1	71.50	Frequent.
5	Oatka Chief.	1897	4.44	2.67		74.	Rare.
		1898	4.0625	2.275	6.8	61.5	Frequent.
6	Long Amber.	1897	5.53	2.32		59.25	Frequent.
		1898	5.5625	2.	7.00	55.50	Rare.
7	Jones' Bearded.	1897	4.53	3.04		85.75	Rare.
		1898	4.375	1.875	6.5	56.25	Frequent.
8	Pride	1897	5.06	2.65		70.5	Abundant
		1898	5.125	2.425	7.1	67.	Frequent.
9	Bearded Winter Fife.	1897	4.80	2.57		61.	Frequent.
		1898	4.875	2.2	6.9	54.75	Frequent.
10	Early Arcadian.	1897	3.37	2.5		65.	Rare.
		1898	3.375	2.625	6.75	74.25	Frequent.
11	Early Genesee Giant (Pedigreed Giant).	1897	3.18	3.2		72.5	None.
		1898	3.0937	2.425	7.1	68.5	Frequent.
12	Diamond Grit.	1897	4.19	2.2		60.	Frequent.
		1898	4.0625	1.75	7.1	58 75	Frequent.

No.	NAME.	Year.	Average length of spike in inches.	Average weight of seeds from one spike in grams.	Weight of 10 cubic centimeters in grams.	Average number of seeds from spike.	Rust.
13	White Seeded Golden Cross.	1897	3.19	2.85		63.5	None.
		1898	3.1875	2.25	6.9	60.5	Frequent.
14	Lancaster Red	1897	4.34	1.95		49.25	None.
		1898	4.37	1.925	7.4	51.75	Rare.
15	Democrat.	1897	4.43	2.		51.75	None.
		1898	4.718	1.975	7.1	54.75	Frequent.
16	Gold Coin.	1897	4.06	2.44		60.	Rare.
		1898	3.7812	1.6875	7.1	48.5	Abundant.
17	Dawson's Golden Chaff.	1897	3.81	1.82		43.75	None.
		1898	4.34	1.875	7.2	51.75	Frequent.
18	Jersey Fultz.						
		1898	3.6875	1.175	7.4	33.75	Rare.
19	Extra Early Oakley.						
		1898	3.781	1.55	7.2	43.	Rare.
20	Gold Coin (?)						
		1898	3.9375	1.525	7.1	42.25	Rare.

4. RED RUST OF WHEAT.

BY H. GARMAN.

The prevalence of this disease, owing to the wet weather during the present season, has led to frequent inquiries from farmers as to its cause and methods of prevention. The subject, together with a discussion of other common diseases of wheat, was presented by the writer last August before the Farmers' Institute at Shelbyville, Ky., and the paper then read was subsequently published in full in the Farmers' Home Journal and the Shelby News, to which papers the reader is referred for a full account of the disease. The use of bluestone or hot water on seed wheat appears to have no effect in checking this disease. All of our wheat on the Experiment Farm was treated by one or the other of these methods last fall, but the rust was prevalent, notwithstanding. The following with reference to the prevention of red rust is quoted from the article above mentioned, as it is printed in the Farmers' Home Journal of August 27th.

"This rust grows on all the small grains and many of the grasses. It becomes common here in midsummer and does its greatest injury then. From what has been said of its development it will be apparent that direct applications to the attacked plants cannot be made with any assurance of success. The parasite grows in the interior of its host-plants, and only appears at the surface to form its spores, and after its growth is complete and its injury done. Applications of such substances as bluestone at this time would doubtless destroy many of these spores, but we do not consider the application of any solution of this kind practicable after grain is pretty well grown; and, as has been intimated, the spores do not become apparent early in the spring.

"The fact that winter spores remain in stubble and straw is the most important one from the practical point of view which my sketch of the development of red rust discloses. It is always this old straw and stubble which furnishes much of the rust which appears on wheat, and where rust is troublesome injury can be reduced by care in removing and burning

straw refuse, and in burning off the stubble after the grain is harvested. Stable manure containing straw from bedding is a common source of injury from rust, and is not to be recommended for use until well rotted.

"I have no evidence on this head myself, but it is believed by good authorities that red rust is hereditary; that is, the small growing threads of which I have spoken penetrate the kernels of grain while the latter are still immature and remain there dormant until the kernels produce plants, when they become active and produce spores. It is asserted that seed grain saved from badly rusted wheat or oats produces badly rusted plants, and that by avoiding such plants in getting seed, then using the precautions in the matter of straw and stable manure which I have recommended, rust need not be feared."